MAT 137
Tutorial #7– Related rates
November 12-13, 2018

1. We are inflating a spherical balloon. At what rate is the volume of the balloon changing when the radius is increasing at $3cm/s$ and the volume is $100cm^3$?

2. A highway patrol officer's radar unit is parked 200m from a long straight stretch of a highway. Down the highway, 200m from the point on the highway closest to the officer, is an emergency call box. The officer points the radar gun at the call box. A minivan passes the call box and, at the moment, the radar unit indicates that the *distance between the officer and the minivan* is increasing at 72 km/h. The posted speed limit is 90 km/h. Does the officer have any reason to apprehend the driver of the minivan?

3. A woman walks along a straight path at a speed of 2 m/s. A searchlight is located on the ground 100 meters from the path and is kept focused on her. At what rate is the searchlight rotating when the woman is 75 meters from the point on the path closest to the searchlight?

4. Alfonso and Ivan are tied at opposite ends of a rope of fixed length. The rope is fully stretched; it starts at Ivan's foot, then passes through a fixed point P on the ceiling, and then continues to Alfonso's foot. The rope is the dashed line in the picture below. The point P is on the ceiling, $4m$ directly above the point Q on the floor. Ivan is running away from Alfonso while Alfonso is just being dragged along the floor. How fast is Alfonso moving at the time when Ivan is $4m$ away from point Q, the distance between Alfonso and Ivan is 6m, and Ivan's velocity is $1m/s$?